CLAIMS

What is claimed is:

1. A method of determining beam quality (BQ) of a laser beam, comprising:

providing a reference value from a theoretical Gaussian laser beam;

determining, for the laser beam, a measured value corresponding to the reference; and

comparing the measured value with the reference value to obtain the beam quality of the laser beam.

2. The method of Claim 1, wherein the reference value is approximately $1-e^{-2}$.

3. The method of Claim 1, wherein the measured value is a normalized power received in approximately the same area as the Gaussian beam for the reference value.

4. The method of Claim 1, wherein the determining comprises measuring the power from the laser beam through an opening having a first diameter corresponding to twice the far-field waist size ω_f of Gaussian laser beam.

5. The method of Claim 4, further comprising normalizing the measured power.

6. The method of Claim 5, wherein the normalizing comprises dividing the measured power by a measured power of the laser beam without an opening.

7. The method of Claim 1, wherein the determining comprises:

measuring power from the laser beam through openings having diameters different than the first diameter;

normalizing the measured powers; and

determining the measured value from the normalized measured powers.

8. The method of Claim 7, wherein the number of measured powers is at least three.

9. The method of Claim 1, wherein the measured value is measured approximately one focal length away from a transform lens.

10. The method of Claim 1, wherein the comparing comprises calculating the square root of the reference value divided by the measured value.

11. The method of Claim 1, wherein the measured value corresponds to twice the second moment of intensity of the laser beam.

12. The method of Claim 1, wherein the laser beam can be at least two different types of laser beams.

13. The method of Claim 12, wherein the different types of laser beams comprises Gaussian, top hat, super Gaussian, transverse modes, and combinations of transverse modes.

14. The method of Claim 1, wherein the laser beam may be selected by all different types of laser beams.

15. A method of determining beam quality for different types of laser beams, comprising:

providing a theoretical value for a Gaussian laser beam;

determining a diameter for an opening corresponding to the theoretical value for the Gaussian laser beam through the opening;

determining a normalized power value for a test laser beam through an opening with the diameter; and

calculating the ratio of the theoretical value to the normalized power value for the test laser beam to obtain the beam quality of the test laser beam.

16. The method of Claim 15, wherein determining the diameter comprises:

determining a near-field waist size ω_n;

determining a far-field waist size ω_f from the near-field waist size ω_n, wherein the diameter is twice the far-field waist size.

17. The method of Claim 16, wherein determining the far-field waist size is calculated from $\omega_f = \frac{\lambda * F}{\pi * \omega_n}$, where λ is the wavelength of the test laser beam and F is the focal length of a transform lens.

18. The method of Claim 16, wherein determining the near-field waist size comprises measuring the test laser beam at one focal length in front of a transform lens.

19. The method of Claim 15, further comprising calculating the square root of the ratio.

20. The method of Claim 15, wherein determining the normalized power comprises dividing a measured power through an opening by a measured power without an opening.

21. The method of Claim 20, further comprising measuring power through a plurality of different size openings.

22. A system for measuring beam quality of a laser beam, comprising:

a transform lens located at least one focal length in front of a laser to be measured;

a sheet with an opening located approximately one focal length in back of the transform lens;

a means for measuring the power of the laser beam through the opening; and

a means for comparing the measured power with a theoretical value for a Gaussian beam to obtain the beam quality of the laser beam.

23. The system of Claim 22, wherein the laser beam can be at least two different types of beams.

24. The system of Claim 22, wherein the means for comparing comprises a processor configured to provide the theoretical value for the Gaussian beam, determine a diameter for a first opening corresponding to the theoretical value for the Gaussian beam through the first opening, determine a normalized power value for the laser beam through an opening with the first diameter, and calculate the ratio of the theoretical value to the normalized power value for the laser beam to obtain the beam quality of the laser beam.

25. The system of Claim 22, wherein the means for measuring comprises a power meter.

26. The system of Claim 22, wherein the means for measuring comprises a camera.

27. A machine-readable medium storing instructions executable by a processor for determining a measure of quality of a laser beam, the instructions having operations comprising:

providing a reference value from a theoretical Gaussian laser beam;

determining, for a test laser beam, a measured value corresponding to the reference; and

comparing the measured value with the reference value to obtain a beam quality of the test laser beam.

28. The medium of Claim 27, wherein the reference value is approximately $1-e^{-2}$.

29. The medium of Claim 27, wherein the test laser beam can be at least two different types of laser beams.